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CONTRACT NAS10-7308

DEVELOPMENT OF A TEST AND FLIGHT  
ENGINEERING ORIENTED LANGUAGE

CIRCULATION COPY

MAY 18 1971

PHASE I ORAL PRESENTATION MATERIAL

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August 1970

Prepared for  
National Aeronautics and Space Administration  
John F. Kennedy Space Center

(NASA-CR-125312) DEVELOPMENT OF A TEST AND  
FLIGHT ENGINEERING ORIENTED LANGUAGE.

PHASE 1: ORAL PRESENTATION MATERIAL W.F.

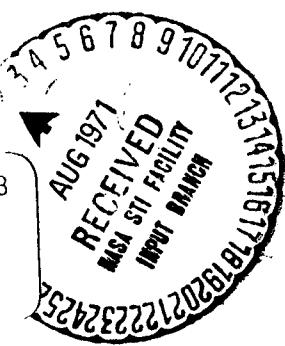
Kamsler, et al (Martin Marietta Corp.)

Aug. 1970 48 Pgs.....

CSCL 09B G3/08

N72-15168

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INTRODUCTION

MARTIN MARIETTA  
DENVER DIVISION

DEVELOPMENT OF A TEST AND  
FLIGHT ENGINEER ORIENTED LANGUAGE

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

KENNEDY SPACE CENTER, FLORIDA

CONTRACT NAS10-7308

PHASE I ORAL PRESENTATION

26 AUGUST 1970

MEMBERS OF THE STUDY TEAM

MARTIN MARIETTA  
DENVER DIVISION

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C. WILLIAM CASE  
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STUDY OBJECTIVES

MARTIN MARIETTA

DENVER DIVISION

1. PERFORM A STUDY OF THE EFFECTIVITY OF TEST ENGINEER ORIENTED LANGUAGES THAT HAVE BEEN EMPLOYED, OR HAVE BEEN PROPOSED FOR EMPLOYMENT, FOR TEST AND CHECKOUT AUTOMATION OF SPACE VEHICLE, AIRCRAFT, AND OTHER RELATED SYSTEMS.
2. ANALYZE AND DEVELOP THE CHARACTERISTICS REQUIRED FOR A LANGUAGE FOR THE SPACE SHUTTLE APPLICATION.
3. PRODUCE A COMPLETE LIST OF LANGUAGE REQUIREMENTS (SPECIFICATIONS) CONSISTENT WITH THE DESIGN CONCEPTS OF THE SPACE SHUTTLE.

STUDY PHASES

MARTIN MARIETTA

DENVER DIVISION

PHASE I

REVIEW THE PAST AND CURRENT DEVELOPMENT  
EFFORT RELATED TO SPACE VEHICLE AUTOMATIC  
CHECKOUT LANGUAGE

PHASE II

DEVELOP THE NEEDED CHARACTERISTICS FOR A  
SPACE SHUTTLE AND FLIGHT ENGINEER ORIENTED  
LANGUAGE

PHASE III

PRODUCE A LIST OF LANGUAGE REQUIREMENTS  
(A SPECIFICATION) FOR THE BASIC DESIGN OF  
THE LANGUAGE

ACCEPTANCE, TEST, OR LAUNCH LANGUAGE (ATOLL)



1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE MORE DIRECT PATH FROM TEST ENGINEER TO  
RCA-110A COMPUTER OBJECT PROGRAM USED IN SATURN PROGRAM

ATOLL PROGRAM STATEMENTS

MARTIN MARIETTA  
DENVER  
DIVISION

1 NAME IBATH  
\*FLT CONTROL PREPS AS-699 REV3 8/26/0 COMP1  
2 CODE A4  
\*THE FOLLOWING ARE THE ASSIGNED FLAG CONDITIONS  
\* FLAG 6 THE FCC SPATIAL COMPARATOR DID NOT SET  
\* FLAG 10 GYRO OUTPUT WAS NOT WITHIN TOLERANCE  
3 MLSR ILUVV, SCOW  
4 D1SA MDO, 378, 379, 694, 1799,  
1801, 1803, 1890  
5 DECL P/SPAT/COMP, DP1AO-12J06-01  
P/CSP/POWER/ON, DP1AO-12J01-06  
6 TERM MDO-1790, MDO+378, MDO-1803  
MDO-1890, MDO-378

## ATOLL PROGRAM STATEMENTS

MARTIN MARIETTA

TELEVER  
DIVISION

```

7 DIS01           MDO,1801          (PITCH SELECT ON)
8 DELY1           5000PP/SPAT'COMP,B001100
9 SFLG1           F6
10 DPLY1          *PITCH SPATIAL COMPARATOR DID NOT SET*
11 DIS01           500MDO,378          (ZERO CMD ON)
12 DIS00           MDO,1790
13 MDSO            MDO,-1890,-1803   (CONTROL RATE GYRO ON)
14 TFLGO           F6,B002500
15 DPLY            *OPTIONS*
                  1CONTINUE
                  2REPEAT COMPARISON SET
                  3TERMINATE
16 SEMIR          ENTER $PR AND OPTION DESIRED
                  4,B001700,B001900,B002300,
                  B002400
17 DPLY            *OPTION ENTERED 1*
18 GOTO           B002500
19 DPLY            *OPTION ENTERED 2*
20 DIS01           500MDO,379          (COMPARATOR RESET)
2050SFLGO         F6
21 GOTO           B000700
22 DPLY            *OPTION ENTERED 3*
23 GOTO           B006100
24 SEMI            PROGRAM HAS LAPSED TO SEMI
                  BY KEYBOARD REQUEST
2450GOTO          B002400

```

ATOLL PROGRAM STATEMENTS

MARTIN MARIETTA  
NEVELER  
DIVISION

25 SETT TCA  
26 RGMT SCOV  
27 DISO1 3000MDO,694 (I.U.RAMP POS)  
28 TESTW 3.25 0.25 0.25VDC AV10,PREF 'PITCH,B003300  
29 DPLY1 \*PITCH REF GYRO OUTPUT WAS NOT IN 2TO4DEG /\*  
\*SEC BAND AFTER RAMP FOR 3 SECS  
30 SFLG1 F10  
• • • •  
• • • •  
• • • •  
• • • •  
• • • •  
61 DPLY TEST HAS BEEM TERMINATED VIA OPERATOR  
SELECTION OF TERMINATE OPTION  
62 MSFG F,-6,-10  
999999END

ATLAS

MARTIN MARIETTA

DENVER DIVISION

DEVELOPED FOR BLACK-BOX TESTING WITH UNKNOWN TEST SYSTEM.

EACH TEST PROGRAM COMPLETELY AUTONOMOUS.

COMPLETE SPECIFICATION OF EXTERNAL (UUT) INTERFACES, ELECTRICAL,  
PNEUMATIC, ETC.

ENGINEER AND TECHNICIAN ORIENTED WITH EMPHASIS ON READABILITY  
WITHOUT SIGNIFICANT TRAINING.

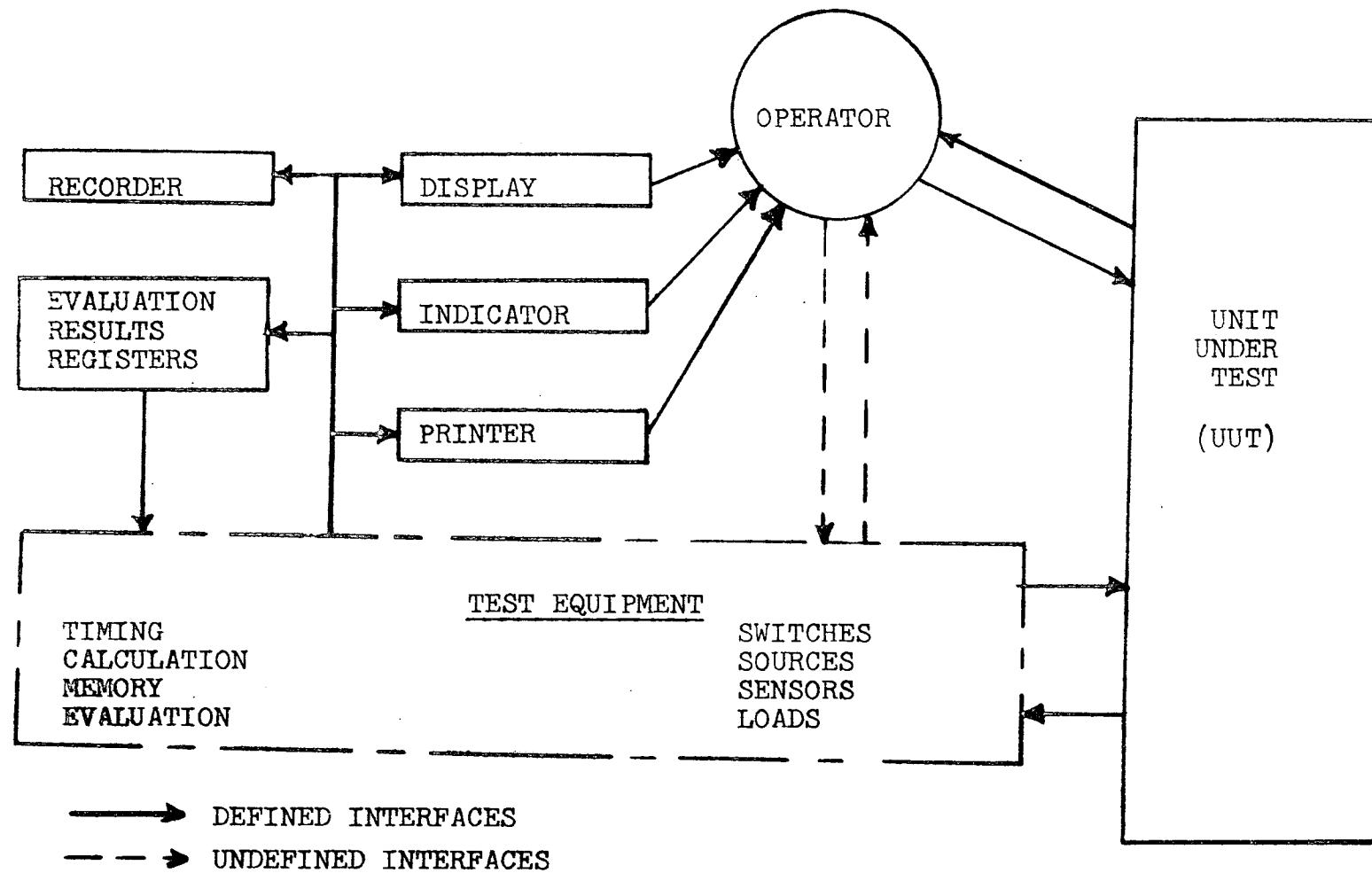
ENGINEERING-LIKE PHRASES IN STATEMENTS, WITH LARGE BUT FAMILIAR  
VOCABULARY.

SPECIFICATION ORGANIZED FOR RAPID REFERENCING AND GUIDANCE.

ALL IDENTIFIERS ENCLOSED IN QUOTE MARKS.

NO PARALLEL PROGRAM CAPABILITY

NO PROVISIONS FOR "POSTING" SUBROUTINES.



## ATLAS STATEMENT CONSTRUCTIONS

MARTIN MARIETTA

DETROIT  
DIVISION

### ATLAS SPECIFICATION SYNTAX DIAGRAM (SIMPLIFIED)

fstatno ✓ APPLY, #noun, #statement characteristics, #conn \$

WHERE:

fstatno=FLAG AND STATEMENT NUMBER

✓ =SINGLE SPACE ONLY

# =ONE OR MORE SPACES

noun =DC SIGNAL, AC SIGNAL, HEAT, SYNCHRO, MANOMETRIC, ETC.

statement characteristics=VOLTAGE, CURRENT, TEMP, PRESSURE, ETC.  
WITH MODIFIERS MAX, MIN, ERRLMT, RANGE, ETC.,  
value AND units.

= # one characteristic# modifier# value-units#

[conn] = CNX HI J1-2 LO J1-1, CNX PITOT-PORT,  
CNX POINT-A, (LOCATIONS ARE UUT NOMENCLATURE)

\$ = STATEMENT TERMINATOR

ATLAS EXAMPLES, PROCEDURE STATEMENTS

MARTIN MARIETTA  
DENVER DIVISION

C IN ALL STATEMENTS, ERRMLT REFERS TO THE ACCURACY  
REQUIRED OF THE TEST SYSTEM IN PROVIDING OR MEASURING  
THE CHARACTERISTIC \$

100101 APPLY, DC SIGNAL,  
VOLTAGE 28.5V ERRMLT + -2.0V,  
CURRENT MAX 300MA,  
CNX HI JI - /A LO JI - 23 \$

100102 VERIFY, (VOLTAGE), DC SIGNAL,  
VOLTAGE ERRMLT + -.01V,  
TEST -EQUIP-IMP MIN 10KOHMS,  
SAMPLE WIDTH MIN 200MS,  
UL 30.5V  
LL 26.5V,  
CNX HI JI - /A  
LO JI - 23 \$

100103 REMOVE, STEP 100101 \$

100103 GOTO STEP 109901 IF LO, STEP  
100109 IF GO \$

## C PREAMBLE STATEMENTS\$

000101 SPECIFY, SOURCE, DC SIGNAL,  
VOLTAGE 28.5V ERRLMT +-2.0V,  
CURRENT MAX 300MA,  
AC COMP MAX 100MV\$

000201 DEFINE, 'DISCRETE 314', SOURCE, DC SIGNAL,  
CNX HI J1-/A  
LO J1-23\$

## C THE FOLLOWING ARE ALTERNATIVES IN PROCEDURES\$

010023 APPLY, 'DISCRETE 314'\$

010023 APPLY, DC SIGNAL, CNX HI J1-/A LO J1-23\$

010023 APPLY, DC SIGNAL, VOLTAGE 28.5V ERRLMT +-2.0V  
CURRENT MAX 300MA, AC COMP MAX 100MV,  
CNX HI J1-/A LO J1-23\$

ATLAS EXAMPLES, DEFINED PROCEDURES

MARTIN MARIETTA  
DENVER DIVISION

C IN PREAMBLE\$

001090 DEFINE, 'CALCHECK', PROCEDURE,  
( 'ENABLE , 'STIM V ,) RESULT ('A')\$

001091 APPLY, 'ENABLE'\$

001092 APPLY, DC SIGNAL, VOLTAGE  
'STIM V', CNX HI J1-1 LO J1-2\$

001093 MEASURE, (VOLTAGE), DC SIGNAL,  
VOLTAGE MAX 11V ERRRLMT +-0.1PC,  
CNX HI J1-14 LO J1-23\$

001094 SAVE, 'MEASUREMENT', 'A'\$

001095 END, 'CALCHECK'\$

C LATER IN PROCEDURE\$

100118 PERFORM, 'CALCHECK',  
'DISC 314', 4.0V, 'CAL .8FS'\$

100128 PERFORM, 'CALCHECK', TABLE  
3 VAR 3 TIMES,  
'DISC 314', 0.0V, 'CAL 0'  
'DISC 314', 2.5V, 'CAL .5FS'  
'DISC 314', 5.0V, 'CAL FS'\$  
C      ENABLE      STIM V      A      \$

## ATLAS MISC. STATEMENTS

NOVATEK INFORMATION SYSTEMS  
DENVER DIVISION

102090 CALCULATE, 'DRIFT' = 'V1' - 'V2'\$

92 COMPARE, 'DRIFT', LT 3.1V\$

93 REPEAT, STEP 100080 IF NO GO\$

95 REPEAT, STEP 100046 THRU STEP  
100050, 13 TIMES\$

102105 REPEAT, STEP 100046, STEP  
100076, STEP 100104\$

102200 MEASURE, TIME INTERVAL\$

01 START WHEN, (VOLTAGE), 'INTEG. OUT',  
EQ 1.0V, MAX TIME 2.0 SEC\$

02 APPLY, DC SIGNAL, 'DISC 315'\$

03 STOP WHEN, (VOLTAGE), 'INTEG. OUT'.  
EQ. 3.5V, MAX TIME 15 SEC\$

04 GOTO, STEP 102207 IF NOGO\$

05 COMPARE, 'MEASUREMENT', UL 8.5  
SEC LL 5.5 SEC\$

06 GOTO, STEP 102300 IF GO\$

07 PRINT, MESSAGE,  
FAILED 1022 INTEGRATOR SLOPE TEST\$

ATLAS MISC. STATEMENTS

MARTIN MARIETTA  
DENVER DIVISION

S104400 ADJUST, DC SIGNAL,  
UUT-1MP MIN 35KOHMS, VOLTAGE  
RANGE 0.0V TO 100V ERRLMT +-0.1V  
BY 0.1V  
RATE 1.0V/SEC,  
CNX HI J3-47  
LO J1-23\$

S 01 TO REACH, (VOLTAGE), DC SIGNAL,  
VOLTAGE ERRLMT +-10MV, EQ 400MV,  
CNX HI J4-13  
LO J1-23\$

02 VERIFY, (VOLTAGE), DC SIGNAL,  
UL 72.5V LL69.4V,  
CNX HI J3-47 LO J1-23\$

110004 WAIT FOR, MANUAL INTERVENTION\$

06 WAIT FOR, 3.0MIN BEFORE STEP  
110100\$

ATLAS MISC STATEMENTS

MARTIN MARIETTA  
DENVER DIVISION

200129 REMOVE, STEP 100102\$

200131 REMOVE, CNX HI J2-47 J1-3  
J2-13 J5-12\$

200245 REMOVE, 'SIGNAL LIST 12'\$

200302 APPLY, AC SIGNAL, VOLTAGE  
+12.0 +J16.0V, FREQ 400HZ,  
DISTORTION MAX 2.0PC,  
CNX HI J4-16  
LO J4-23  
REF HI J4-1  
LO J4-23\$

200401 CALCULATE, 'F42'=1

200622 COMPARE, 'F42', EQ 1\$

200623 GOTO, STEP 202206 IF EQ\$

200624 PRINT,MESSAGE,

ALTERNATE TEST REQUIRED                    REF. F42 OFF \$

PROCEDURE - ORIENTED LANGUAGE FOR AEROSPACE APPLICATIONS.

A SUBSET OF SPACE PROGRAMMING LANGUAGE (SPL)

PRIMARY APPLICATIONS - GUIDANCE AND NAVIGATION.

ORIENTED TO ARITHMETIC AND LOGICAL MANIPULATIONS.

DESIGNED FOR USE BY A PROFESSIONAL PROGRAMMER.

NOT A TEST-ORIENTED LANGUAGE.

THE CLASP LANGUAGE CONSISTS OF FIVE TYPES OF STATEMENTS

MARTIN MARIETTA

DENVER DIVISION

- 1) DATA DECLARATION.
- 2) FORMULAS AND ASSIGNMENT.
- 3) PROGRAM CONTROL.
- 4) SUBPROGRAM DEFINITION.
- 5) COMPILER DIRECTIVES.

CLASP DATA DECLARATION EXAMPLES:

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DENVER DIVISION

- 1) DECLARE FIXED MTP 24 12
- 2) DECLARE INTEGER= 0, K, L, M = 1, N
- 3) DECLARE BOOLEAN, UP = TRUE, HIGH = ON, DOWN = FALSE, LOW = 0
- 4) DECLARE TEXT, MESSAGE 13
- 5) DECLARE INTEGER, MATRIX (3,4) = (0,-6,-48,3,4,6,4(7),59,11)
- 6) ABLE. DECLARE INTEGER, A,B,C,D
- 7) DECLARE HARDWARE I, INDEX1 = 1, INDEX2 = 2
- 8) OVERLAY A,B,D,C, = K,L,M,N

CLASP FORMULA AND ASSIGNMENT EXAMPLES:

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DENVER DIVISION

- 1)  $\underline{MTP} = (\underline{\text{ALPHA}} + 2) / (\underline{\text{ZLIK}} + (\underline{\text{PI}}^{**3})) - 3.14 + \underline{\text{BETA}}$
- 2)  $\underline{A} = \underline{MTP}$  LSH 1
- 3)  $\underline{B} = \underline{A} \text{ LAND } \underline{B}^1010101^1$
- 4)  $\underline{A}, \underline{B}, \underline{C} = 4, \underline{Q/R}, \text{ ABS } (\underline{Y})$
- 5)  $\underline{\text{ALPHA}} (*, 4) = \underline{\text{MATRIX}} (*, 4)$
- 6)  $\underline{A} = \underline{N}$

CLASP PROGRAM CONTROL EXAMPLES:

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DENVER DIVISION

- 1) STAGE. ABLE = X \* Y
- 2) GOTO STAGE
- 3) GOTO (LOC1, ,LOC3,LOC4)INDX
- 4) IF ALPH LS BETA  
THEN GOTO STAGE  
ELSE ALPHA = BETA  
END
- 5) FOR I = 1 BY 2 TO N  
STATEMENTS  
END
- 6) LOCK INAME  
STATEMENTS
- 7) UNLOCK INAME
- 8) ON INAME  
STATEMENTS  
EXIT

CLASP SUBPROGRAM DEFINITION EXAMPLES:

MARTIN MARIETTA  
DENVER DIVISION

- 1) PROC .CALC (A, B, C = OUTPUT)  
DATA DECLARATIONS  
STATEMENTS  
EXIT
- 2) .CALC (X, Y, Z = W)
- 3) PROC .SIN (X)  
DECLARE FIXED 24 12, SIN, X, RESULT  
DATA DECLARATIONS  
STATEMENTS  
SIN = RESULT/2  
EXIT
- 4) IF X3 - .SIN (2\*PI\*F) GR 0.5  
THEN GOTO L1  
END
- 5) CLOSE .GAMMA  
STATEMENTS  
EXIT
- 6) .GAMMA

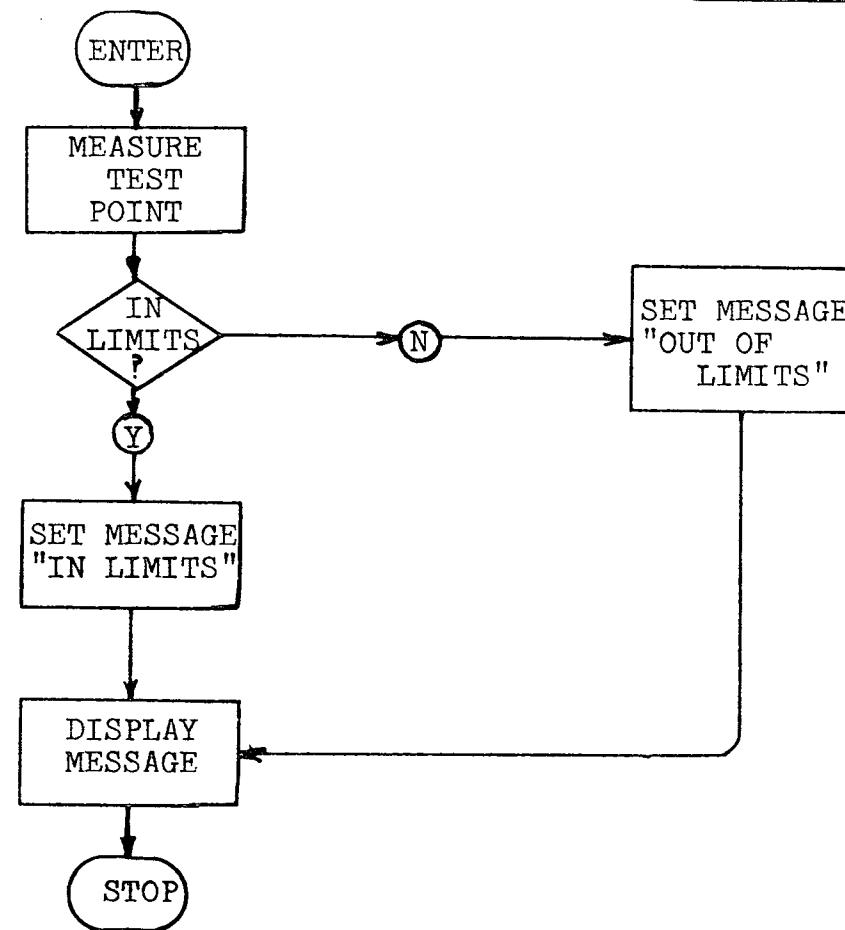
CLASP COMPILER DIRECTIVE EXAMPLES:

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DENVER DIVISION

- 1) TRACE TEST, FIND  
STATEMENTS
  - 2) UNTRACE
  - 3) COUNT (3)  
STATEMENTS
  - 4) UNCOUNT (3)
  - 5) OPTIMIZE TIME (5)  
STATEMENTS
  - 6) UNTIME
  - 7) OPTIMIZE SPACE (2)  
STATEMENTS
  - 8) UNSPACE
  - 9) DIRECT  
MACHINE CODE
- END

FLOW CHART FOR SAMPLE CLASP PROGRAM

MARTIN MARIETTA  
DENVER DIVISION



```
START "SAMPLE CLASP PROGRAM"
DECLARE FIXED, MTP "MEASUREMENT TEST POINT" 24 12.
DECLARE TEXT, MESSAGE 13 = 1
DIRECT
"A DIRECT CODE PROCEDURE WOULD APPEAR HERE TO *  

PERFORM I/O ASSOCIATED WITH MEASURING THE TEST *  

POINT AND STORING THE VALUE MEASURED IN MTP." *
END
IF MTP LS 9.9 OR MTP GR 10.1 "VOLTS"  

THEN MESSAGE = 1 OUT OF LIMITS 1  

ELSE MESSAGE = 1 IN LIMITS 1
END
DIRECT
"A DIRECT CODE PROCEDURE WOULD APPEAR HERE TO *  

PERFORM I/O ASSOCIATED WITH MESSAGE OUTPUT"  

END
STOP"THIS SAMPLE TEST"
TERM
```

TOOL - TEST ORIENTED ONBOARD LANGUAGE

MARTIN MARIETTA  
DENVER DIVISION

SPECIAL PURPOSE, TEST ORIENTED APPLICATION  
TEST SYSTEM ORIENTED FIXED FORMAT LANGUAGE  
TRANSLATOR-INTERPRETER MODE OF EXECUTION  
PART OF AN ON-LINE INTERACTIVE MULTIPROGRAMMED  
CHECKOUT SYSTEM FOR SPACECRAFT  
SELF-TEACHING.  
CONCURRENT TEST EXECUTION.  
TEST PRIORITIES AND PROTECTION.  
RESOURCE ALLOCATION.

## TOOL PRIMITIVES

MARTIN MARIETTA

DENVER DIVISION

<u>NAME</u>	<u>PURPOSE</u>
AGAIN	TERMINATE DO LOOP
BEGIN	BEGINNING OF TEST
CALL	CALL A SEQUENCE
CHECK	CHECK CONTENTS OF DATA CELL
CLEAR	CLEAR HARDWARE UNIT
CONNECT	CONNECT STIMULUS SWITCH
DELAY	DELAY ELEMENT EXECUTION
DISCONNECT	DISCONNECT STIMULUS SWITCH
DISPLAY	DISPLAY ON PLASMA OR MICROFILM
DO	START DO LOOP
END	END OF TEST
EVALUATE	EVALUATE DATA
GOTO	UNCONDITIONAL BRANCH
IF	CONDITIONAL BRANCH
INTERRUPT	INTERRUPT EXECUTION ON TIME OUT
MEASURE	MEASUREMENT DEVICE CONTROL
MILESTONE	SPECIAL DISPLAY ON PLASMA
READ	READ DATA
RECORD	RECORD DATA
REPEAT FLAG	REPEATABLE ELEMENTS FLAG
START	START TEST ON CONCURRENT LEVEL
STIMULATE	STIMULUS UNIT CONTROL
STOP	STOP TEST ON CONCURRENT LEVEL
TRANSFER	TRANSMIT DATA

PLASMA DISPLAY WORK AREA:

SEQ NASA . BEGIN

PASSWORD: KSC

[TO BE COMPLETED BY OPERATOR]

MICROFILM CUE FRAME:

431 WRITE MODE

BEGIN ELEMENT - SELECT PROTECTION KEYS

ENTER N NO PROTECTION

C CALL EXECUTE INHIBIT

K KEYBOARD EXECUTE INHIBIT

D DELETE INHIBIT

R REVIEW INHIBIT

M MODIFY INHIBIT

MULTIPLE ENTRIES MUST BE IN THE ABOVE  
ORDER AND SEPARATED BY COMMAS.

EXAMPLE: C, K, R

PLASMA DISPLAY WORK AREA:

SEQ NASA STIMULATE  
DC VOLTS SGU1 AUTO ON  
[TO BE COMPLETED BY OPERATOR]

MICROFILM CUE FRAME:

554 WRITE MODE - STIMULATE ELEMENT  
DC VOLTAGE AMPLITUDE  
ENTER VOLTAGE AMPLITUDE IN THE FORM:  
 $\pm$ XX.XX; -40.00 VOLTS/PEAK  $\leq$ XX.XX $\leq$  +40.00 VOLTS/PEAK  
OR AS A DATA CELL NUMBER, DO TO D9

CAGE TEST LANGUAGE (CTL)

MARTIN MARIETTA  
DENVER DIVISION

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE A NEAR ENGLISH TEST ORIENTED LANGUAGE  
FOR USE WITH THE TITAN-IIIM CHECKOUT EQUIPMENT

## CAGE TEST LANGUAGE --OFF LINE TRANSLATOR

**MARTIN MARIETTA**

**DENVER DIVISION**

		ELEMENT																		
MODIFIER	BEGIN	END	SEQUENCE	REP/TEST	APPLY	CONNECT	STIMULATE	MEASURE	CK/ANALOG	CK/DISC	SET / (DMS) (PCM)	DEFER/ (KEY) (TIME)	CONTINUE	SYSTEM/TEST	TIME	RESET	REPEAT	DISPLAY	SAVE	RESTORE
	TEST NO.	NONE	SEQ. NAME	RT NAME	CAGE NO.	CAGE NO.	D/A NO.	A/D NO.	CAGE NO.	CAGE NO.	CAGE NO.	DEFER/ (KEY) (TIME)	CONTINUE	SYSTEM/TEST	TIME	RESET	REPEAT	DISPLAY	SAVE	RESTORE
			"P" LIST		B/G NO.	MODE	INTER-VAL	GROUP NO.	GROUP NO.	TIME VALUE	"P" LIST	INTER-VAL	B/G		MILE-STONE					
					SIN	RNG	LIMITS	ON/OFF	ON/OFF	ON/OFF		DELAY	A/D		DATA					
					FREQ	SAMPLE	COMPUTA-TION	N/M	OPEN/CLOSE	DEF. ELE-MENTS		C/D VALUE	ALL		STA-TUS					
					LEVEL	LIMITS	RE-TAIN	DEC. TIME	ERON/EROF			C/D START	ANAL. SW. NO.		PAUSE					
					RNG	INTER-VAL	ADD, SUB DIV	COND. TEST	ALT. ACTION			C/D STOP	ANALOG		NO-GO					
					DURA-TION	SMOOTH	DATA1 DATA9		NULL, AMB, OP.LIM			PAUSE/SEQ	TIMER NO.		PRINT					
					SPS	COND. TEST							C/D		LCC					
					POINTS								DISC SW. NO.		CAGE NO.					
					COND. TEST								DISC NO.		DE-VICE NO.					
					DATA RATE										AMB					

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE A COMMUNICATION MEDIUM BETWEEN THE TEST  
ENGINEER AND THE VIKING SYSTEM TEST EQUIPMENT

ADAPTIVE INTERCOMMUNICATION ROUTINE (ADAP)

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DENVER DIVISION

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

PROVIDE PROCESS INTERCOMMUNICATION BETWEEN UPLINK AND DOWNLINK

ACE-S/C CHECKOUT OPERATIONS INVOLVED WITH APOLLO PROGRAM

AUTOMATIC SEQUENCE EXECUTION AND PROCESSOR (ASEP)

MARTIN MARIETTA

DENVER DIVISION

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

PROVIDE FOR PARAMETRICALLY CONTROLLED SEQUENCES IN THE  
SKYLAB TEST PROGRAM (ATM)

- DEVELOPED FOR SATURN, BUT NOT IMPLEMENTED.
- WOULD PROBABLY HAVE BEEN MODIFIED IF IMPLEMENTED.
- COULD BE MADE QUITE READABLE BY DILIGENT PROGRAMMER.
- IS SIGNIFICANTLY PROGRAMMER ORIENTED.
- REQUIRES MANY DECLARATIONS.
- EXTENSIVE CAPABILITIES FOR ARRAYS, LISTS, PAIR-LISTS, ETC.
- ACCOMMODATES:
  - RCA 110A TO RCA 110A COMMUNICATIONS
  - PARALLEL PROGRAMS AND MONITORING
  - POSTING OF SUBROUTINES
  - ANALOGS
  - ARITHMETIC
- DIFFICULT MANUAL, SOME ERRORS AND OMISSIONS.

## ATOLL-II STATEMENT EXAMPLES

MARTIN MARIETTA

DENVER DIVISION

PROC INCREMENT.LOAD (A) AMP.EVERY (B) SEC  
 (A PROCEDURE WOULD FOLLOW USING A AND B AS PARAMETERS)

DECLARE EXTERNAL DOV (TRANS.SW.1=D214)TURN ON TRANS.SW.1 ELSE GO TO TS1M1-30/10 PULSE OFF TRANS.SW.1 FOR 2.0 SEC ELSE GO TO TS1M2-28/00 DISO TRANS.SW.1=OFF ELSE GO TO TS2M2DOMNTR DOV12,FTPL2,EXFCUTE BUR2

:

RELEASE DOMNTR (DOV12)POST MONITOR CHECK.HYDRA.PRESSSAMPLE FWD.BATT.VOLTAGE,ARRAY.3,INDEX.4,FOR 10 SEC.DO.3 DO (J)=1,16,1 WHILE FWD.BATT.VOLTAGE GT 26.0 VDCINCREMENT.LOAD 1.0 AMP.EVERY 5 SECEND DO.3M INTERROGATE DOM,\$ WHAT IS THE DAY OF THE MONTH? \$REQUEST (64) VALUE.LIST.12TRANSMIT (32) SIGNAL.LIST.7PT9B PROC PARALLEL.TEST.9DISO K108=ON,K102-OFF,K304=ON,PS.1=ON,BATT.2=ON  
 ELSE GO TO PT9S1

:

PT9S1 SYNC (1)

:

END PT9BSPT9 START PARALLEL.TEST.9 AT 5 SEC AFTER STEP SPT9TURN ON VOR.RECEIVER ELSE GO TO D214

SYNC (1)

MOLTOL

MARTIN MARIETTA

DENVER  
DIVISION

- DEVELOPED FOR MANNED ORBITING LAB, NOT IMPLEMENTED.
- VERY SIMILAR TO ATOLL-II, INCLUDES ATOLL-II FEATURES.
- PROVIDES FOR CONTROL OF STATEMENT EXECUTION RATE.
- PROVIDES FOR COMMUNICATING WITH ON-BOARD COMPUTER.
- PROVIDES FOR DEFINING NEW TERMS FOR MOLTOL PRIMITIVES, E.G.  
    DEFINE TURN ON AS DISO.
- MANUAL SOMEWHAT BETTER THAN ATOLL-II, SOME OMISSIONS.

MOLTO STATEMENT EXAMPLES

MARTIN MARIETTA  
DENVER DIVISION

DOPA     APPLY DO, PROF.A, ELSE EXECUTE SEMI.1  
        SET PWR.A.ON.COMMAND, ELSE GO TO CMD.CHECK  
        APPLY 5.0 VDC TO UR.VDA.INPUT, ELSE GO TO A102  
        APPLY VDA.STIM.ARRAY TO VDA.INPUT.LIST, ELSE EXECUTE SEMI.2  
        OPEN PRESSURE.RELIEF.VALVE, ELSE RUN  
        DISPATCH 23,1, ELSE EXECUTE TEST.OBC  
        READ PWR.A.VOLTAGE TO PAV(1,1)  
SCAN     SAMPLE AILIST,AIVOLTS.ARRAY,NO.SAMPLES, 10 SEC FOR 10 MIN  
        IF PWR.B.VOLTAGE LT 26.0 VDC, THEN EXECUTE SEMI.1  
        INCREMENT=250  
        C=(ARCTAN(Y/X))\*0.5

TOL LANGUAGE COMPARISONS

MARTIN MARIETTA

DENVER DIVISION

- 1 APPLY A VOLTAGE TO OPERATE A RELAY
- 2 RELAY IS CALLED "BATTERY TRANSFER"
- 3 CHECK A RELAY CONTACT TO VERIFY RELAY OPERATION
- 4 OPERATE TIME MAY BE AS LONG AS 10 MILLISECONDS
- 5 CONTINUE WITH NEXT TEST IF "GO"
- 6 DISPLAY ERROR MESSAGE AND HOLD IF "NO GO"

ATOLL COMPARISON TEST

MARTIN MARIETTA  
DENVER DIVISION

000100 NAME	ILAFF
000200 CODE	A4
001000 DISA	MDO,123
~~~~~	
001400 DIS01	MDO,123
001500 DELY1	10 MDI111,B003100
001600 SEMI1	*BATTERY TRANSFER CONTROL NO GO REF 0015*
~~~~~	
003100 TFLG1	F14,B999999
⋮	
999999 END	

ATLAS COMPARISON TEST

MARTIN MARIETTA  
DENVER DIVISION

000100 BEGIN ATLAS PROGRAM \$  
000112 DEFINE,'BATT TRANS CONT', SOURCE,DC SIGNAL,VOLTAGE  
28.5V,CURRENT MAX 300MA,CNX HI SIJ4-202 LO COMMON \$

000122 DEFINE,"BATT TRANS IND",SENSOR,(VOLTAGE),DC SIGNAL  
VOLTAGE MAX 32V,CURRENT MAX 100MA,GT 25.0V,  
CNX HI SIJ4-303 LO COMMON \$

E100121 APPLY,'BATT TRANS CONT'\$

23 DELAY,10 MS \$

25 VERIFY,'BATT TRANS IND'\$

26 GO TO,STEP 100100 IF GO\$

27 DISPLAY,MESSAGE,  
BATTERY TRANSFER NO GO   REF. 1001 \$

28 WAIT FOR,MANUAL INTERVENTION \$

B\$

E100100 GO TO -----\$

B999999 TERMINATE ATLAS PROGRAM \$

CLASP COMPARISON TEST

MARTIN MARIETTA  
DENVER DIVISION

START "BATTEST"  
DECLARE FIXED,MDI 24 12  
DECLARE TEXT,MSG 5 = 'NO GO'  
DIRECT  
A1. "MACHINE CODE TO CONNECT AND APPLY VOLTAGE \*  
TO BATTERY TRANSFER CONTROL,AND READ \*  
BATTERY TRANSFER INDICATOR AND STORE VALUE, \*  
APPROPRIATELY SCALED,IN MDI."  
END  
IF MDI GR 25.0  
THEN GOTO NEXTEST  
END  
DIRECT  
"MACHINE CODE TO OUTPUT NOGO MESSAGE"  
END  
STOP A1  
NEXTEST. STATEMENT  
STATEMENT  
STOP  
TERM

TOOL COMPARISON TEST

MARTIN MARIETTA  
DENVER DIVISION

BEGIN BATTE ST  
CONNECT D213

STIMULATE DC, VOLTAGE, +28.0V, AS

DELAY 0:0:10

MEASURE DC, D512, D1, +28.0V

CHECK LIMITS, +30.0V, +25.0V, D1

IF IN, 10  
STIMULATE CLEAR  
DISPLAY MESSAGE, AMD, ADU, \$NO GO\$

END B

10 STATEMENT

:

STATEMENT

END A

FIN

\*SEQUENCE BATEST

\*SEQUENCE ELEMENTS

10.0 SET/DMS,OPEN,1D747

APPLY,1D747

CK/D,1D748,ON,10MS,10.1

BEGIN 20.0

10.1 D/NO-GO,DISC,STOP

RESET,1D747

20.0 (NEXT TEST)

.

.

.

END

ATOLL-II COMPARISON TEST

MARTIN MARIETTA  
DENVER DIVISION

BGNA BEGIN BATT.TEST

DECLARE EXTERNAL DOV(BATT.TRANS.CONT=D213)

DECLARE EXTERNAL VDI(BATT.TRANS.IND=D512)

CONSOLE=A4

C102 TURN ON BATT.TRANS.CONT, ELSE GO TO BTNG

DELAY 10 MS

C IF BATT.TRANS.IND IS ON, THEN GO TO NEXTEST,  
ELSE CONTINUE

BTNG HALT \$ BATTERY TRANSFER IS NO GO C102 \$

NEXTEST ---

ENDA END BATT.TEST

- TEST ORIENTED LANGUAGES
  - PROVIDE A LANGUAGE TO ACCOMPLISH AUTOMATIC CHECKOUT TASKS.
  - AID IN ACCOMPLISHING AUTOMATION THROUGH MAN-MACHINE COMMUNICATION.
- WHY A NEW LANGUAGE?
  - TO CORRECT DEFICIENCIES FOUND IN EXISTING TEST ORIENTED LANGUAGES.
  - INCORPORATE WHAT HAS BEEN LEARNED FROM PAST EFFORT.

PROBLEMS

MARTIN MARIETTA

DENVER DIVISION

DIFFICULT TO LEARN TO WRITE  
DIFFICULT TO LEARN TO READ  
ABSENCE OF ARITHMETIC CAPABILITIES  
LACK OF SAFEGUARDS  
MINIMUM CHECKING FEATURES  
CHECKOUT SYSTEM DEPENDENT